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PREDICTING ACHIEVEMENT FOR DEAF CHILDREN.

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THIS STUDY WAS DONE TO DETERMINE THE PREDICTIVE VALUE OF INDIVIDUAL AND GROUP ACHIEVEMENT TESTS WHEN USED TO EVALUATE DEAF CHILDREN. THE 36 CHILDREN SELECTED FOR THIS STUDY WERE IN GRADES 2, 4, AND 6 IN THE KENNEDY SCHOOL IN DAYTON, OHIO. ALL HAD SEVERE AUDITORY HANDICAPS AND WERE 10 TO 16 YEARS OLD. FOUR PSYCHOLOGISTS ADMINISTERED THE FOLLOWING TESTS--(1) LEITER INTERNATIONAL PERFORMANCE SCALE (LIPS), (2) GREY STANDARDIZED ORAL READING PARAGRAPHS, (3) BENDER VISUAL-MOTOR GESTALT, (4) WECHSLER INTELLIGENCE SCALE FOR CHILDREN (WISC) PERFORMANCE SCALE, (5) WIDE RANGE ACHIEVEMENT TEST (WRAT), AND (6) KNOX CUBE TEST FROM THE GRACE ARTHUR PERFORMANCE SCALE. ALL CHILDREN WERE ALSO GIVEN THE METROPOLITAN ACHIEVEMENT TEST (MAT), FORM B (1959). THE BENDER GESTALT RESULTS WERE DISCARDED FOR NONRELEVANCY TO THE FACTORS UNDER STUDY. RESULTS INDICATED THAT (1) THE LEITER IQ SCORE WAS 15 TO 20 POINTS LOWER THAN THE WISC PERFORMANCE IQ SCORE (79-86), (2) THE GROUP APPEARED TO BE 3 YEARS OVERAGE FOR THEIR ACTUAL GRADE PLACEMENT BASED ON MAT SCORES. THE PEARSON PRODUCT MOMENT COEFFICIENT OF CORRELATION REVEALED SIGNIFICANT CORRELATIONS BETWEEN--(1) LEITER AND GROUP READING TEST SCORES (.01 LEVEL), (2) KNOX CUBE, WITH INDIVIDUAL READING (.01 LEVEL), (3) LEITER WITH THE INDIVIDUAL READING SCORES (.01 LEVEL), (4) LEITER AND WISC PERFORMANCE (.01), AND (5) WISC PERFORMANCE SCALE AND INDIVIDUAL READING (.05 LEVEL). IN THE THIRD ANALYSIS OF DATA, MULTIPLE CORRELATIONS USING AIKEN'S NUMERICAL SOLUTION OF REGRESSION ARE PRESENTED TABULARLY. SOME CONCLUSIONS ARE (1) THE LEITER MENTAL AGE GRADE PLACEMENT SCORE IS THE SINGLE BEST PREDICTOR OF SUCCESS IN THE LANGUAGE ARTS FOR DEAF CHILDREN IN THE ELEMENTARY GRADES, (2) THE KNOX CUBE RAW SCORE IS THE SINGLE BEST PREDICTOR OF SUCCESS IN THE DEVELOPMENT OF WORD RECOGNITION SKILLS AND ORAL LANGUAGE IN DEAF CHILDREN IN THE ELEMENTARY GRADES, AND (3) A COMPLETE EVALUATION SHOULD INCLUDE THE LEITER, KNOX CUBE, AND WISC PERFORMANCE SCALES. (RS)

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PREDICTING ACHIEVEMENT FOR DEAF CHILDREN

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OHIO DEPARTMENT OF EDUCATION
Columbus 15, Ohio

1963

ACKNOWLEDGMENTS

The study reported in the following pages was a joint effort on the part of The Dayton Public Schools and the Division of Special Education. Such an effort obviously demands the time and effort of many people.

Mr. Ray Horn, Director of the Division of Special Education, first identified the need for such a study and provided the needed administrative support which brought it into existence.

Mr. Edward C. Grover, Psychologist, Division of Special Education, and Polly Alexander, Psychologist, Ohio State School for the Deaf, tested twenty-one of the children in the sample. Mrs. Alma Ward Jones, Chief Psychologist, and Kathleen Pachelman, School Psychologist, Dayton Public Schools, did the balance of the individual testing.

Miss Christina Jones, Educational Specialist, Division of Special Education, and Lucy Caldwell, Supervisor of the Deaf Program, Dayton Public Schools, administered and scored the group achievement tests.

Mr. William Beitzel, Supervisor of Special Education, Dayton Public Schools, joined the above professional staff members in planning the study.

The statistical analysis of the data was conducted under the supervision of Dr. Donald C. Smith, Coordinator, Child-Study Center, The Ohio State University.

Finally, all of the professional staff involved in the study wish to express their sincere appreciation to the 36 deaf children who participated in the study and to their teachers and parents.

PREDICTING ACHIEVEMENT

FOR

DEAF CHILDREN

INTRODUCTION

The evaluation of deaf children for educational placement and programming presents one of the more difficult tasks faced by School Psychologists. In addition, there has been little agreement in the past over the selection of instruments for this purpose. The Grace Arthur, the Nebraska, the Ontario, the Randall Island, the Performance Scale of the WISC and the Leiter have all been recommended from time to time and used to evaluate deaf children.

In recent years the Performance Scale of the WISC and the Leiter have been used with increasing regularity throughout Ohio. These two scales appear to disagree to a significant extent when administered to the same child. Apparently no objective evidence exists to support the choice of one instrument over the other.

The Division of Special Education invited the staff of the Dayton Public Schools to participate in this study and the procedures outlined below were developed cooperatively with the Dayton staff.

This study concerns itself with the predictive value of the Leiter and WISC Performance Scales as indicated by individual and group achievement tests.

SUBJECTS

The children selected for this study included all children in grades 2, 3, and 4 enrolled in day school classes in Kennedy School in Dayton during the 1960-61 school year. This group of children was selected because it was assumed that this would provide an adequate and representative sample of children with severe auditory handicaps. These children had progressed academically to the point where language and academic skills had developed sufficiently to assure some degree of measurement and differentiation.

This selection provided an original sample of 39 children (18 girls, 21 boys) in grades 2, 3, and 4, with calendar ages ranging from 10 to 16 years. In the final sample 36 children were included. (19 boys, 17 girls). Two boys and one girl were absent for prolonged periods due to illness and complete data for them was not available.

PROCEDURE

Four school psychologists participated in the actual testing of the children. Each of these school psychologists had acquired extensive experience in working with deaf children in an educational setting. All of the individual psychological testing was done at Kennedy School during the months of January and February, 1961.

In the first individual evaluation the psychologist administered the following tests:

1. Leiter International Performance Scale
2. Gray Standardized Oral Reading Paragraphs
3. Bender Visual-Motor Gestalt

In the second individual evaluation on another day the psychologist administered:

4. Wechsler Intelligence Scale for Children, Performance Scale.
5. Wide Range Achievement Test
6. Knox Cube Test, Grace Arthur Performance Scale

In all cases the administration was standardized to conform to the directions in the manual except that gestures were used to help interpret the instructions. The first five subtests of the WISC Performance Scale were used and the Maze test was omitted.

The psychologist also attempted to evaluate each child's oral language on a three point rating scale: no oral language, minimal oral language and adequate oral language for age, grade and mental maturity.

The Bender results were evaluated by one of the psychologists participating in the study and by one other psychologist with extensive clinical experience with the Bender. The Benders were rated on a two point developmental rating scale using both Bender and Koppitz norms. They were then classified as average, above or below average for chronological age.

All other tests were scored according to instructions in the test manuals.

All children included in the study were given the Metropolitan Achievement Tests: Form B (1959), Primary I or Primary II Battery. These tests were administered to the children in two groups during February, 1961, in Kennedy School. The directions were given orally and group hearing aids were used. The tests were administered by Miss Lucy Caldwell, and proctoring was done by Miss Christina Jones. These tests were scored by Miss Jones.

After assembling the data the rating on oral language was discarded. This type of rating failed to differentiate as most of the children were rated as having minimal oral language.

The Bender results were also discarded. While this test is probably a fine clinical tool it did not seem to relate in any way to the factors under study.

On the Metropolitan Achievement Test the spelling score was discarded because it was available only for those children who took the Primary II Battery.

Considerable discussion centered around whether to use the combined Arithmetic and Reading Score or simply the Total Reading Score. It was decided to use the latter. For prediction and educational placement at the elementary level this seems to be the most significant factor. The Total Arithmetic Score was retained for educational purposes.

With the individual achievement scores the mean score of the Wide Range and the Gray Oral Test was used.

The raw score for the Knox Cube was used along with the I.Q. and Mental Age Grade Equivalent for the Leiter and WISC Performance.

RESULTS

On the basis of the preceding discussion the final data include child's code number, sex, chronological age, grade, Leiter Mental Age Grade Equivalent, I.Q., WISC Performance Mental Age Grade Equivalent, WISC Performance I.Q., Knox Cube Raw Score, Total Reading, Total Arithmetic and mean individual reading score. This data is reported in Table I below.

TABLE I

Test Data Obtained on 36 Deaf Children in Grades 2, 3, 4, in Kennedy School, Dayton, Ohio during January and February, 1961.

No.	Grade	Sex	C. A. Yr.- Mo.	Leiter M.A. G.E.	Leiter I.Q.	WISC - P M.A. G.E.	WISC - P I.Q.	Knox Cube	Total Read.	Total Arith.	Mean Ind.Read.
1	4	F	10-11	5.9	104	6.7	111	7.5	3.8	3.3	4.5
2	4	F	13-10	4.5	103	5.8	118	12.0	3.8	3.5	5.8
3	4	M	13-10	7.2	96	9.8	114	8.0	3.3	3.0	3.1
4	3	F	11-0	5.0	96	5.6	100	9.5	3.1	3.3	4.4
5	4	F	13-1	5.7	85	6.7	92	9.0	2.8	3.0	4.1
6	3	F	9-8	4.5	104	5.0	108	14.0	3.0	3.1	4.3
7	4	F	12-7	6.9	98	8.9	114	9.0	2.6	2.7	4.9
8	4	M	14-4	3.7	69	8.3	99	8.0	2.5	2.7	3.4
9	3	F	11-1	1.8	64	2.6	72	9.5	2.4	2.6	3.7
10	4	M	11-8	7.2	108	8.7	122	7.0	2.8	3.5	3.3
11	3	F	9-6	2.3	79	4.8	107	10.0	3.3	3.2	2.8
12	3	M	14-1	2.8	58	5.3	78	7.5	2.5	2.4	3.9
13	3	M	10-2	3.0	83	3.3	86	8.0	2.6	2.9	3.3
14	2	F	10-3	4.2	93	6.0	111	7.5	2.3	2.2	2.9
15	3	M	12-4	3.2	71	7.6	107	12.5	2.5	Absent	3.1
16	3	M	10-3	1.6	67	4.8	99	12.5	2.3	2.7	3.1
17	4	F	14-2	2.3	55	2.6	57	6.0	2.5	2.3	2.8
18	4	M	12-11	6.9	95	12.9	133	10.0	2.3	2.7	3.5
19	3	M	11-1	5.5	98	5.1	94	7.5	2.0	1.8	2.4
20	3	M	11-6	2.3	66	3.8	80	5.0	2.0	1.9	1.5
21	3	M	13-7	5.0	77	8.1	101	12.5	2.3	1.8	3.9
22	3	M	12-9	4.0	74	6.9	97	11.0	2.0	1.7	4.0
23	4	F	12-1	3.2	71	7.0	103	6.5	3.0	2.9	3.8
24	4	M	15-9	3.0	63	5.6	74	6.5	2.2	3.1	2.4
25	3	M	11-9	2.3	70	5.1	97	7.5	1.8	1.6	2.9
26	3	M	10-2	2.6	77	4.9	101	8.0	2.0	1.7	2.9
27	4	F	14-8	2.1	56	5.2	74	6.0	2.4	2.9	2.3
28	3	F	12-11	3.5	69	4.4	76	10.5	2.0	1.8	2.1
29	2	F	10-2	4.0	88	6.6	113	6.0	1.8	1.9	1.7
30	2	M	10-7	3.7	86	6.2	110	7.5	1.7	1.8	2.2
31	3	F	10-0	2.1	73	5.2	106	8.0	1.7	2.1	1.5
32	3	M	14-4	6.2	82	6.4	85	11.0	1.7	1.8	4.4
33	3	M	14-1	1.6	49	7.8	97	11.0	1.8	1.7	3.8
34	3	F	12-2	2.8	67	1.8	57	7.0	1.9	1.7	2.7
35	3	F	11-3	2.6	69	3.2	76	4.5	1.8	1.7	1.8
36	3	F	14-5	4.2	69	6.4	85	12.0	1.6	1.7	2.9
	Mean		12-2	3.9	79	6.0	96		2.4	2.4	3.2

The results reported in Table I above were first subjected to analysis in an attempt to understand the nature of the group as revealed by central tendencies. For this group of 36 children the average chronological age was 12 years and 2 months. The average Leiter I.Q. was 79 while the average WISC Performance I. Q. was 96. This tends to support the rule-of-thumb that has emerged from experience with these children that the Leiter tends to run about 15 to 20 I.Q. points lower than the WISC Performance on deaf children.

Converting the mental ages in years and months to a grade equivalency using California Test Bureau Tables (Age and I.Q. Calculators) enables us to obtain an expectancy score which may be compared to achievement scores. The mean Leiter Mental Age Grade Equivalency was 3.9, the mean WISC Performance Mental Age Grade Equivalency was 6.0.

The mean Total Reading Score from the Metropolitan Achievement Test was 2.4. The Total Arithmetic Score was also 2.4 on 35 children. The mean individual reading score, obtained by averaging the Word Recognition score from the Wide Range Achievement Test and the oral reading score from the Gray Standardized Oral Reading Paragraphs was 3.2

On the basis of this analysis the group appears to be about three years overage for their actual grade placement. As a group these children are obtaining achievement scores on both the group and individual tests that are significantly lower than the I.Q. tests would predict. When allowance is made for the readiness work that is necessary to develop language concepts, it is apparent that the Leiter mental age gives a fairly realistic prediction of educational functioning.

As a second step in the analysis of this data the Pearson Product Moment Coefficient of Correlation was obtained for the following factors: Leiter I.Q., WISC Performance I.Q., Knox Cube raw scores, Total Reading Grade Placement from the Metropolitan and average reading grade placement from the Wide Range and Gray Oral. This data is reported in Table II.

TABLE II

Coefficients of Correlation Between Selected Test Scores Obtained on 36 Deaf Children in Grades 2, 3, & 4 in Kennedy School, Dayton, Ohio during January and February, 1961.

	Grp. Read.	Ind. Read.	Leiter	WISC	Knox
Leiter	.59**	.42**	-	.81**	.16
WISC	.10	.31*	.81**	-	.16
Knox	.20	.53**	.16	.16	-

** Significant at the .01 level
* Significant at the .05 level

Highly significant correlations were obtained between the Leiter and the group reading test score and between the Knox Cube and Leiter with the individual reading test scores. The Leiter and WISC are highly related while the Knox Cube is not significantly related to either Leiter or WISC.

In the third step of our analysis of the data multiple correlations were run on selected factors using Aitken's numerical solution of regression. The results are reported in Table III below.

TABLE III

Multiple Correlations Between
Selected Test Scores Obtained on
36 Deaf Children in Grades 2, 3, & 4
in Kennedy School, Dayton, Ohio
during January and February, 1961

	Grp. Read.	Ind. Read.
Leiter & WISC	.87	.42
Leiter & Knox	.59	.63
WISC & Knox	.21	.58
Leiter & Knox & WISC	.88	.63

DISCUSSION

These 36 deaf children are presently placed in grades which are, on the average, about 3 years below the grade placements of normal children with similar chronological ages.

Their achievement scores tend to be from 3 to 4 years below the achievement scores of normal children of the same age.

These results would seem to suggest that the Leiter mental age grade equivalency establishes realistic expectancy for these children.

The Leiter is the best predictor of group reading scores while the Leiter and Knox Cubes are the best predictors of individual reading scores.

The Leiter and the WISC Performance predict group reading test scores rather well while a combination of Leiter and Knox Cube test scores are more successful in predicting individual reading.

The full implications of these results are not clear. It does seem reasonable to assume that the group reading achievement test scores are the best indication of school success in the language arts area. The individual reading test scores involve oral language and it is possible that this factor may be significant in terms of this study.

If the above assumptions are acceptable then the following conclusions seem to be reasonable:

1. The Leiter mental age grade placement score is the single best predictor of success in the language arts program for deaf children in the elementary grades.

2. The Knox Cube raw score is the single best predictor of success in the development of word recognition skills and oral language in deaf children in the elementary grades.

3. The WISC Performance mental age grade placement score improves the Leiter prediction of language arts achievement.

4. The Leiter mental age grade placement score improves the Knox Cube predictions of word recognition and oral language.

5. A complete evaluation of young deaf children for educational purposes should probably include the Leiter International Performance Scale, the Performance section of the Wechsler Intelligence Scale for Children and the Knox Cube sub-test from the Grace Arthur Performance Scale.

A FINAL NOTE

At the time the study reported in the previous pages was initiated a three-year longitudinal study was also designed. Since then a longitudinal study on the Leiter has been published.[1] The first paragraph of the conclusions is quoted below:

> "The findings of this study indicate that significant weight can be given to the L.I.P.S. (Leiter) in predicting school success among deaf children. There has been no significant decrement over an 8 to 10 year period in the correlation between ratings based on L.I.P.S. I.Q.'s and school achievement in the language arts area."

The evidence appears to be mounting in favor of the Leiter as one of the primary instruments for use with deaf children.

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[1] Birch, Jane R., Stuckless, E. Ross, and Birch, Jack W. "An Eleven Year Study of Predicting School Achievement in Young Deaf Children." American Annals of the Deaf. 108:236-40; March, 1963.